Issue 905

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eUpdate

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These e-Updates are a regular weekly item from K-State Extension Agronomy and Kathy Gehl, Agronomy eUpdate Editor. All of the Research and Extension faculty in Agronomy will be involved as sources from time to time. If you have any questions or suggestions for topics you'd like to have us address in this weekly update, contact Kathy Gehl, 785-532-3354 kgehl@ksu.edu, or Dalas Peterson, Extension Agronomy State Leader and Weed Management Specialist 785-532-0405 dpeterso@ksu.edu.

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1. Does Grazing Cover Crops Impact Soil Properties?

Cover crops are typically used by producers in dryland no-till cropping systems to improve soil health, reduce soil compaction, enhance nutrient cycling, improve soil structure, and improve water infiltration.

Producers may be able to realize some income from cover crops by grazing or haying them. But is this a good idea or will it cancel out any benefit the cover crops would otherwise have on soil properties and residue cover?

It is difficult to answer this question in a general way. Each situation can be a little different depending on what species or mixture of different species is being used as the cover crop, the soil texture, the cropping system being used, the timing of the grazing or haying, the stocking rate if it's being grazed, precipitation and soil moisture conditions, and more.

We recently conducted a two-year study on three producer fields in west central Kansas to study the effect of grazing cover crops on various soil properties. We were also able to compare these soil properties with those of adjacent native perennial pastures.

Figure 1. Cover crop plots being grazed at a farmer's (Ted Banister) field in Alexander, KS. Photo by

Logan Simon, K-State Research and Extension.

Description of the study

It's important to know specifically what was tested in this study. First of all, there were two locations in 2018-19, and one in 2019-2020:

- 2018-2019. Near Marquette, in northwest McPherson County, on a dryland no-till field in a wheat-wheat-soybean rotation. A winter cover crop mixture of triticale/rapeseed/radish was planted in the fall following the wheat phase and ahead of soybeans. Cover crop grazing by heifers occurred from December 17, 2018 through February 10, 2019 (55 days) at a stocking rate of 5.4 animal unit months (AUM) per acre.
- 2018-2019. Near Hays on a dryland no-till field in a wheat or triticale-sorghum-fallow rotation. A summer cover crop was planted immediately following triticale. Cover crop grazing with lactating cows occurred from August 24 through October 10, 2019 (48 days) at a stocking rate of 5.2 animal unit months (AUM) per acre.
- 2019-2020. Near Marquette on a dryland no-till field in a wheat-sorghum-soybean rotation. A winter cover crop mixture of triticale/rapeseed/radish was planted in the fall following the wheat phase and ahead of sorghum. Cover crop grazing by heifers occurred from January 9 through February 17, 2020 (39 days) at a stocking rate of 4.2 animal unit months (AUM) per acre.

Each site had grazed and ungrazed cover crop plots. Haying was not one of the variables in this study.

Biomass samples were taken before grazing began on the grazed plots, and at the time of termination on both the grazed and ungrazed plots. Soil samples were taken for analysis after the termination of cover crops and before the subsequent soybean or sorghum crop was planted. Soil samples were also taken from adjacent native perennial grass pastures in 2020 at both Hays and Marquette.

Results

Residue cover: In general, grazing reduced the biomass of cover crops, but only by about 29%. The cover crop species used in these tests had significant regrowth after grazing, which compensated for the amount of biomass eaten or trampled by the cattle. The amount of biomass in the grazed plots after grazing was about the same as what is was before grazing, indicating good regrowth. Careful species selection and grazing of cover crops, as done in this study, can leave adequate residue cover to protect the soil and meet soil health goals.

Soil structure: There was no significant difference in soil bulk density, soil aggregate size distribution, or mean weight diameter (MWD) of soil aggregates between grazed and ungrazed cover crop plots. Grazing also had no significant effect on soil organic matter concentrations or soil pH compared to ungrazed cover crop plots.

As a side note, there were many significant differences in soil properties between the cover crop plots and the adjacent pastures. These differences, however, are probably due mostly to the effects of the crop production practices used on the cover crops for several years prior to the start of this study. The results from the pasture samples are included in Table 1 just as a matter of information, but are not relevant to the main objective of the study -- which was to look at the effect of grazing cover crops on plant biomass levels and soil properties.

Table 1. Selected soil physical and chemical properties affected by cover crop management, with a comparison to adjacent perennial pasture soil, 3-year average (aggregates sampled to a 2-inch depth; all other properties sampled to a 6-inch depth)

Soil property	Grazed cover crops	Ungrazed cover crops	Pasture
Bulk density (g/cm^3)	1.35 a	1.31 a	1.20 b
Large macroaggregate %	29.2 b	32.2 b	68.9 a
Small macroaggregate %	43.1 a	43.4 a	21.8 b
Microaggregates %	27.7 a	24.5 a	9.3 b
Mean weight diameter (in.) of soil aggregates	0.050 b	0.051 b	0.148 a
Soil organic carbon %	1.55 b	1.70 b	2.36 a
Total N %	0.15 c	0.17 b	0.23 a
pH	5.62 b	5.76 b	6.71 a
Means in a row followed by different letters indicate significant differences at $a<0.05$			

Full details of this study can be found in Kansas Field Research 2021:

https://newprairiepress.org/cgi/viewcontent.cgi?article=8078&context=kaesrr

Other studies

There have been few other studies that have looked at the effect of grazing cover crops on soil properties. One six-year study near Brownell, in Ness County, tested oats-triticale as a cover crop to replace fallow in a no-till wheat-sorghum-fallow rotation. The cover crops were treated as ungrazed, grazed, and hayed. This study also found that bulk density and soil porosity in the cover crop plots were not affected by grazing or haying, and were often not different from fallow.

Soil organic carbon stocks were either greater or similar with cover crops compared to fallow and were dependent upon adequate cover crop residue inputs. Water stable aggregates were consistently larger with standing and grazed cover crops compared to fallow in both years.

The authors of that article conclude: These findings suggest that cover crops may be grown in place of fallow to produce desirable forage of good quality for livestock especially when grazed or hayed

early. Further, dual-purpose management strategies may provide benefits to soil health similar to those obtained when cover crops are not grazed or hayed. However, careful management is critical to maintain adequate residue. Grazing cover crops would be more desirable than mechanical forage harvest to maintain soil properties when forage productivity is low.

That study was published in Agronomy Journal: Simon L. M., Obour A. K., Holman J. D., Johnson S. K., Roozeboom K. L. Forage productivity and soil properties in dual-purpose cover crop systems. *Agronomy Journal*. 2021;*113*:5569-5583. https://doi.org/10.1002/agj2.20877

Earlier studies by former K-State agronomist Humberto Blanco-Canqui and others in southwest Kansas looked at the effect of haying, but not grazing, of cover crops on soil properties. Results of those studies suggest that harvesting cover crops for forage, being careful to retain adequate residue, may be done without negating potential benefits to soil health. Those agronomists also believed that potential near-surface soil compaction due to cover crop grazing could be eliminated with the alternate wet–dry and freeze–thaw events that occur annually in the Central Great Plains.

Overall conclusions

Based on these results, we conclude that grazing of cover crops can be a viable management option to intensify no-till crop production to improve soil health and maintain or increase overall system profitability. Further research will be needed to determine the long-term effects of cover crop grazing in no-till production systems.

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2. Considerations for Pasture Turn-out

It has been a late spring in 2022 across most of Kansas. Lack of fall and winter moisture has delayed plant growth this spring. Cool-season pastures of tall fescue and smooth brome are normally producing adequate forage for grazing by April. Turn-out on our native grasslands dominated by warm-season grasses varies across the state from mid-April to mid-May (Fig. 1).

Figure 1. Cattle grazing native grass pasture. Photo by Walt Fick, K-State Research and Extension.

Lack of sub-soil moisture, persistence of drought, and cool temperatures have slowed green-up in many areas of the state. In the last report from the U.S. Drought Monitor nearly 75% of Kansas was experiencing abnormally dry to exceptional drought conditions (Fig. 2).

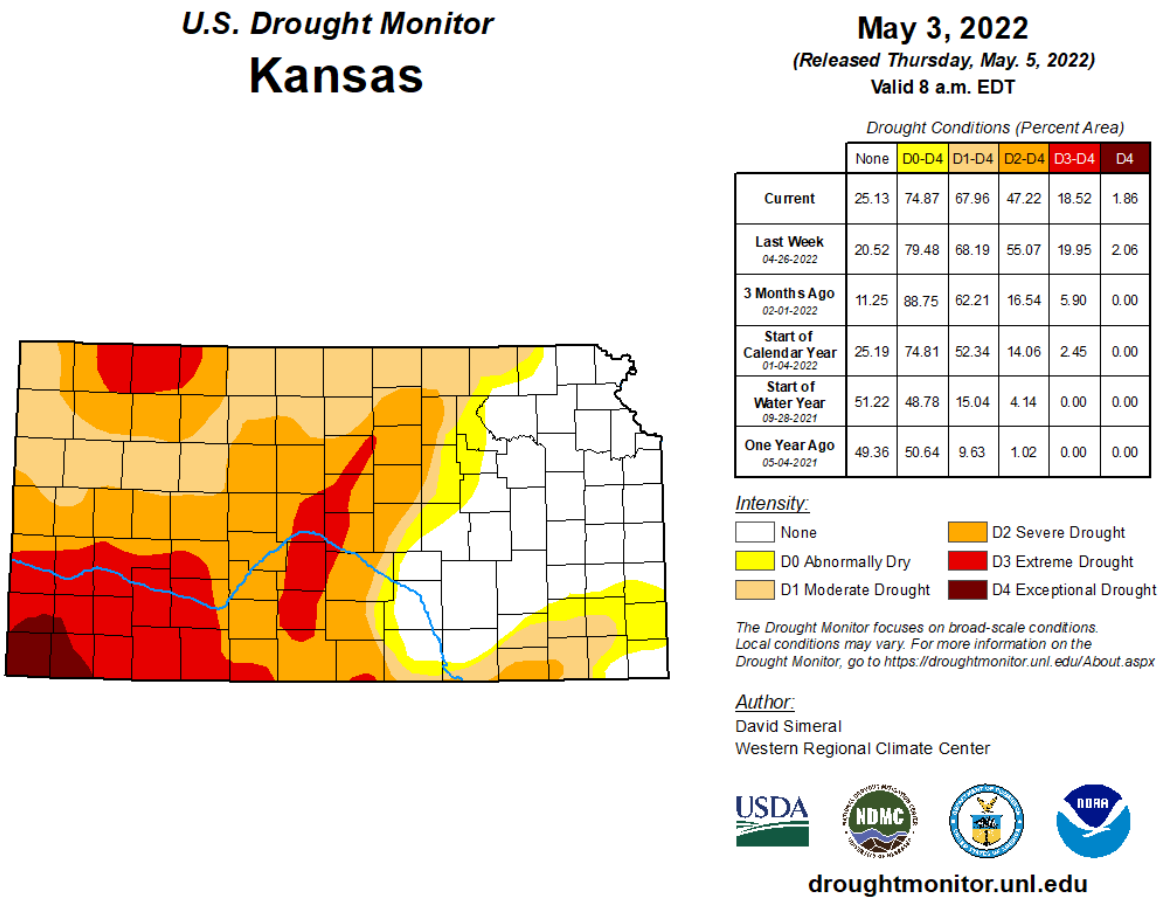

Figure 2. U.S. Drought Monitor for Kansas, May 3, 2022.

The question becomes, when should I turn-out livestock on my pastures? Historically, this decision has been referred to as range readiness, especially on seasonally grazed pastures. Range readiness occurs when plants have had the opportunity to make good growth and grazing may begin without damage to the vegetation or soil.

As pastures start to green-up the temptation is to start grazing as soon as possible. Initially, plants use stored food reserves to start growth. These reserves are stored in the roots, rhizomes, crown, and stem bases, depending on the plant species. Once the plant has enough leaf area, photosynthesis takes over and supplies the energy required for plant growth. Repeated defoliation before sufficient leaf area exists to supply the plant's energy needs can result in reduced plant vigor and even plant death.

Grasses vary in their resistance to grazing pressure. The amount of leaf area needed before grazing starts varies, but some have suggested that grasses should have a minimum of three leaves. Warm-season grasses that are 2 to 4 inches tall and rapidly growing are ready to graze. Even at this height, dry or cool and cloudy days can reduce plant growth rates allowing the livestock to get ahead of available forage. Remember, a 1200-pound cow will consume over 31 pounds of dry matter per day.

If pastures are not ready to graze, one option is to use deferred grazing. That is, continue to feed or graze alternative forages, such as cool-season grasses, and delay moving animals to native range.

Don't delay too long though, as forage quality declines with plant maturity and livestock gains may suffer. Increased stocking rates may be used with deferred grazing assuming normal plant growth and fewer days of grazing. Another option would be to supplement an energy source for cattle grazing in the early season.

What should a manager do if drought persists and forage production is reduced? Be prepared. The National Weather Service is predicting above-normal temperatures and below-normal precipitation for the next 30 to 90 days in Kansas. Hopefully, managers have a drought plan in place with specific target dates used for making decisions. Once drought is eminent, implement the plan and stick to it.

If forage production is going to be less in 2022, what can I do about stocking rates? Forage production varies across the state depending on precipitation and ecological site. A common ecological site in Kansas is loamy hills. In a normal year production can vary from 1500 lbs/acre in the west to 4250 lbs/acre in the east. Here are some stocking rates across Kansas with normal and below normal production (lbs/acre) for cow-calf pairs for a 150-day grazing season:

Forage production	West lbs/a	Acres/pair	Central lbs/a	Acres/pair	East lbs/a	Acres/pair
Normal	1500	16	3000	7.6	4250	5.5
Below normal	750	32	2150	10.7	3000	7.6

Normally, we would like to leave 50% of current years' production. What would utilization be if we have below normal production and want to graze for 150 days?

	West	Central	East
Utilization (%)	98	72	71

What are the consequences if we remove more than 50% of current years' production? At 50% removal of leaf volume, root growth stoppage is minimal, or just starting to occur for a short period of time. As utilization increases, root growth stoppage increases exponentially. At 70% removal of leaf volume, root growth stoppage is 78% and at greater than 80% removal, root growth stoppage is 100%.

Root growth depends on the amount of leaf area remaining after defoliation and the presence of buds to initiate growth. High defoliation rates will not only reduce root growth, but also prune back the root system. Fewer shallower roots will reduce plant vigor, decrease water and nutrient uptake, and make the plants less tolerant of drought.

One way to reduce utilization would be to decrease the length of time animals are grazing. How long can we graze with lower forage production and not decrease stocking rates?

	West	Central	East
Forage production (lbs/acre)	750	2150	3000
Acres/pair	16	7.6	5.5
Days of grazing	77	105	106

All the examples discussed are based on a cow-calf pair weighing 1500 lbs and consuming 2.6% of

their body weight. Adjustments would need to be made for different size or class of animals.

Further information related to drought and potential forage production can be found at the following websites:

https://drought.unl.edu/ranchplan/

https://grasscast.unl.edu/

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Note: First published in the April 30, 2022 issue of K-State Research and Extension's Beef Tips, edited by Sandy Johnson, Livestock Specialist, Northwest Research-Extension Center.

3. Control of Volunteer Enlist Corn in Enlist E3 Soybean

Recent development of Enlist corn allows the use of 2,4-D choline (Enlist One), glyphosate (Roundup PowerMax), glufosinate (Liberty), and aryloxyphenoxypropio-nate (FOPs) herbicides for controlling grass and broadleaf weeds. However, volunteer Enlist corn plants can cause infestation in subsequent Enlist E3 soybean (resistant to 2,4-D, glyphosate, and glufosinate) in areas where a corn-soybean rotation is commonly practiced.

Figure 1. Volunteer Enlist corn plants competing with Enlist E3 soybean at Agricultural Research Center in Hays. Photo by Vipan Kumar, K-State Research and Extension.

A research study in 2020 at the Agricultural Research Center-Hays tested the effectiveness of Select Max and Poast Plus alone or in tank-mixtures with Enlist One. Treatments were applied either as an early postemergence (8- to 12-inch tall corn), or late postemergence (12- to 30-inch tall corn).

Results indicated that Select Max applied early postemergence alone provided an excellent, season-long control (95 to 99%) and highest biomass reduction (up to 100%) of volunteer Enlist corn in Enlist E3 soybean. However, volunteer corn control was significantly reduced when Enlist One was tank-mixed with Poast Plus.

Volunteer corn control was low to moderate (50–85%) with all late postemergence programs tested. Soybean grain yield did not differ among early postemergence treatments (39 to 44 bu/a), while grain yield was significantly lower (about 34 bu/a) for late postemergence treatments.

These results suggested that the early postemergence application of Select Max and Poast Plus can effectively control volunteer Enlist corn infestation in Enlist E3 soybean. However, tank-mixing Enlist One with Poast Plus could compromise the efficacy of Poast Plus.

Table 1. List of herbicide treatments tested

Treatments	Herbicide program	Rate (fl oz/a)	Timing
1	Select Max*	16	Early Post
2	Poast Plus**	24	Early Post
3	Select Max* + Enlist One	16 + 32	Early Post
4	Poast Plus** + Enlist One	24 + 32	Early Post
5	Select Max*	16	Late Post
6	Poast Plus **	24	Late Post
7	Select Max* + Enlist One	16 + 32	Late Post
8	Poast Plus** + Enlist One	24 + 32	Late Post
9	Nontreated	--	--
10	Hand weeded	--	--
* Nonionic surfactant at 0.25% v/v was included			
** Crop oil at 1% v/v and ammonium sulfate (AMS) at 2% wt/v was included			

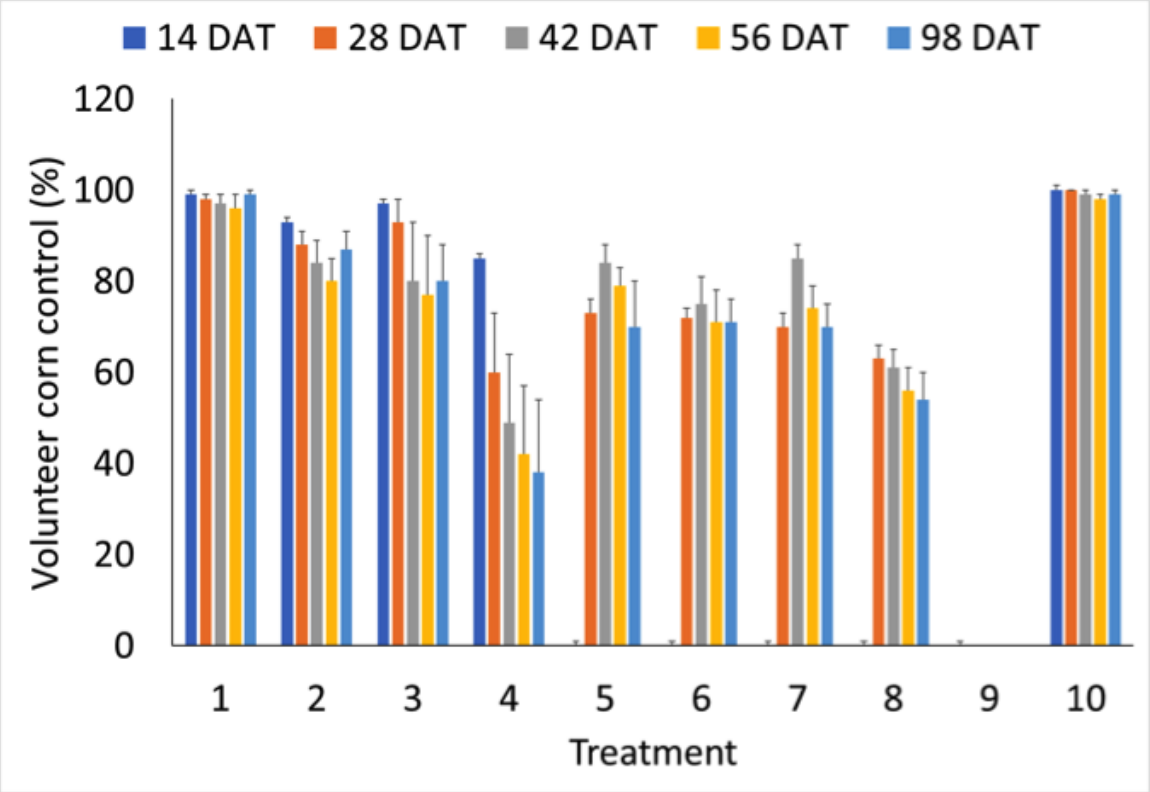

Figure 2. Effect of herbicide treatments on volunteer Enlist corn control in Enlist E3 soybean at 14, 28, 42, 56, and 98 days after treatment (DAT).

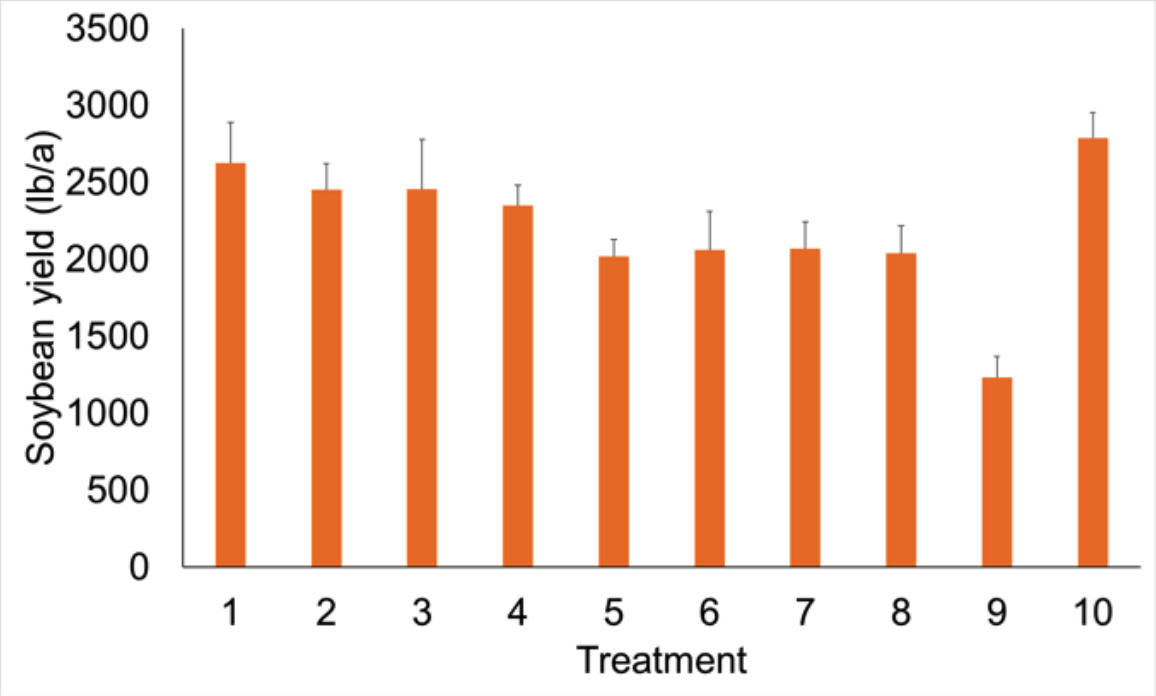

Figure 3. Effect of herbicide treatments on Enlist E3 soybean grain yield.

The full report can be found in the 2021 Kansas Field Research Report:

https://newprairiepress.org/cgi/viewcontent.cgi?article=8091&context=kaesrr

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4. Wheat Disease Update: May 4th 2022

As wheat moves into the flowering stage of growth in southeast Kansas and into heading and boot stages of growth in central Kansas, there are a few diseases that are on the mind of many producers and advisors, including:

- Rusts (stripe and leaf)
- Fusarium head blight (scab)
- Wheat streak mosaic virus (and related viruses)

In this article we will discuss the current outlook for these diseases, and the potential need for management.

Stripe rust and leaf rust

At the time of publication, we have not detected stripe rust (**Figure 1**) or leaf rust in Kansas. This indicates that dry conditions have substantially limited the spread of these pathogens in this region. Forecasted warm, dry weather ahead suggests that there is low likelihood of a yield-limiting rust outbreak in 2022. Exceptions include pockets of the state, such as the southeast, that are experiencing higher rainfall levels.

With this warm, dry weather in mind many are weighing the need for wheat foliar fungicides this season. We suggest prioritizing fields with yield potential greater than 40 bu/acre, fields that are under irrigation, or fields that are being used for seed production. Fields that have experienced substantial yield reductions due to drought will likely not benefit from an application at this point.

For more information about specific fungicide product efficacy, please see the K-State foliar fungicide efficacy ratings: https://bookstore.ksre.ksu.edu/pubs/ep130.pdf.

Figure 1. Classic symptoms of stripe rust. No stripe rust has been reported in Kansas as of May 5, 2022. Photo by K-State Research and Extension.

Fusarium head blight (aka Scab)

As a reminder, the wheat crop is only susceptible to Fusarium head blight during flowering (when yellow anthers are present). Early flowering (Feekes 10.5.1) is the optimal timing for a scab fungicide application. As the southeast part of the state comes into the flowering period of growth, it will be important to carefully monitor crop growth states for a scab fungicide application. We are currently seeing slightly elevated weather risk in Cherokee, Crawford and Allen counties (**Figure 2**). We will

continue to report risk as the rest of the state moves toward the flowering growth stage.

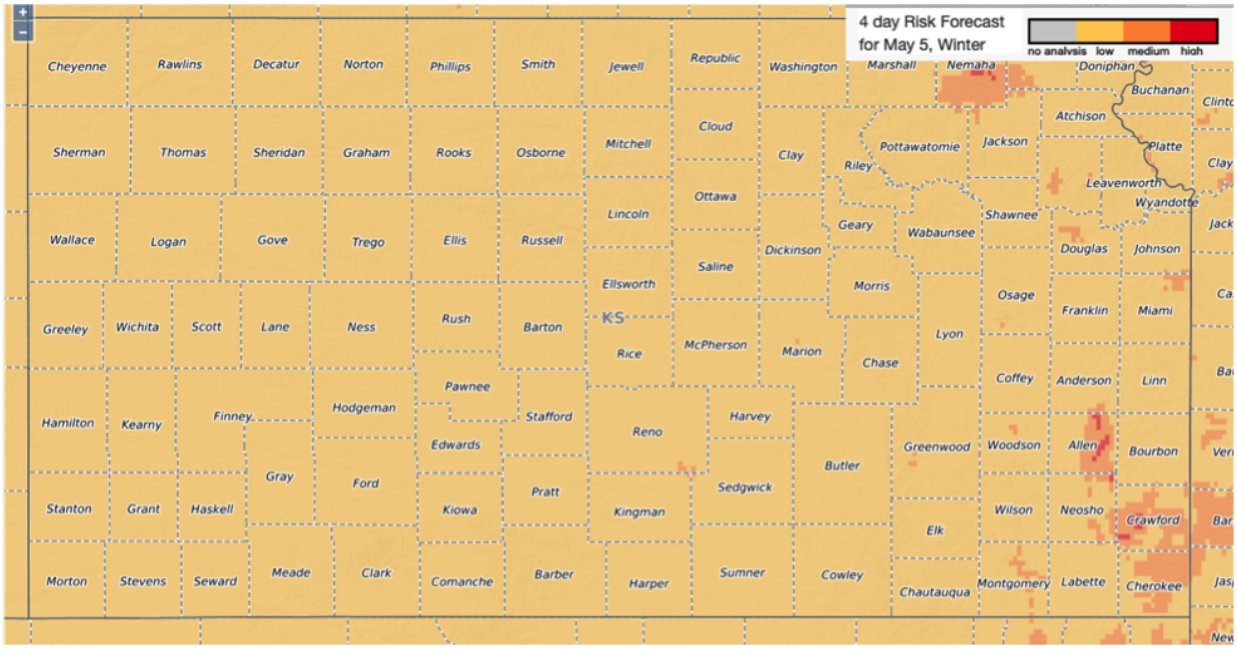

Figure 2. Fusarium head blight (Scab) risk forecast for the next 4 days after May 5 according to wheatscab.psu.edu. This model is calibrated for very susceptible varieties, which should be prioritized for a fungicide application. Yellow indicates low risk, while red indicates elevated risk.

Fungicides such as Prosaro, Caramba, Proline, or Miravis Ace are known to suppress scab. Other fungicides are not labeled or not recommended for scab control. These fungicides are most effective against scab when applied at early flowering (Feekes 10.5.1), but can provide protection even when applied later in the flowering window. It is important to pay attention to pre-harvest intervals at this point of the season and follow guidelines provided on product labels. The products listed above have either a 30-day pre-harvest interval (cannot be applied within 30 days of harvest) or cannot be applied after Feekes 10.5.4 (end of flowering, watery ripe growth stage).

It is important to remember that early flag-leaf fungicide applications will have little to no effect on scab.

Wheat streak mosaic virus

Warming weather has led to the expression of wheat streak mosaic virus (**Figure 3**) symptoms in several parts of Kansas. Even for the highly trained eye, it can be difficult to differentiate symptoms of wheat viruses. Wheat streak mosaic virus symptoms can be easily confused with other viruses. Multiple viruses can also be present in the same plant. Samples can be submitted to the K-State Plant Diagnostic Clinic for verification of viral diseases. Contact your local K-State Extension Office for more information.

Figure 3. Plants with classic symptoms of wheat streak mosaic virus that were submitted to the K-State plant diagnostic clinic this week. Photo by K-State Reseearch and Extension.

You can find more information about the K-State plant diagnostic lab here: https://www.plantpath.k-state.edu/extension/diagnostic-lab/

Contact information for K-State Plant Disease Diagnostic Lab: clinic@ksu.edu

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5. 2022 Canola Field Days - May 12

The latest research, variety, and production information on winter canola (Fig. 1) will be featured at two K-State Research and Extension (KSRE) field days on May 12.

Figure 1. Field of flowering winter canola. Photos by Mike Stamm, K-State Research and Extension

The field days are an opportunity to see winter canola variety trials and producers' fields. Experimental and new varieties will be on display and information will be shared about K-State's hybrid parent line development program.

With harvest season approaching, harvest management options will also be discussed. Producers will have opportunities to get their questions answered about making winter canola a viable rotation option in Kansas.

This has been another interesting production year, most notably with the onset of drought conditions. It was evident as the crop entered reproductive stages that lack of moisture is the leading concern. Hopefully more favorable spring weather will position the crop for a good harvest.

- The first field day will be held in Kingman County south of Norwich at 11 a.m. From the KS-2 and SE 150th Avenue intersection, drive north and take a left on SE 160th St. The plots are ¼ mile west on the south side of the road.

- The second field day will be held in Sumner County northwest of Caldwell at 3 p.m. From the KS-44 and S. Milan Rd. intersection, turn south and drive 1 ¼ miles. The plots are on the east side of the road.

Sandwiches will be provided at the Kingman County site. **Please RSVP by May 11** to Kallie Turner at kalliet@ksu.edu or by calling the Kingman County Extension Office at 620-532-5131.

For more information, contact Mike Stamm at 785-532-3871 or mjstamm@ksu.edu.

6. Wheat Tour Schedule 2022

The Department of Agronomy and K-State Research and Extension will host several winter wheat variety plot tours in different regions of the state, starting May 11, 2022. Make plans to attend a plot tour near you to see and learn about the newest available and upcoming wheat varieties, their agronomics, and disease reactions.

A preliminary list of plot tour locations, dates, times, and directions is provided below. Stay tuned to the eUpdate in the coming weeks as this list is updated.

Plot	Agent	Date	Time	Directions
Isabel	Justin Goodno	May 11	11:00 a.m.	Hwy 42 and Main Street in Isabel
KS/OK line	Justin Goodno	May 11	6:00 p.m.	Corner of Hwy 281 and Clairmont Rd, 3 miles east of Hartner
Harper	Jenni Carr	May 12	8:30 a.m.	2 miles east and ½ mile south of Harper on east side of the road
Viola	Randy Hein	May 16	6:00 p.m.	922 West 140th Ave. North, Conway Springs.
Marquette	Shad Marston	May 20	10:00 a.m.	Patrick Plot, north side of HWY 4 on Marquette Rd
Moundridge	Shad Marston	May 20	1:00 p.m.	Galle plot, just east of the corner of Cherokee and 22nd Ave.
Inman	Shad Marston	May 20	3:00 p.m.	Schroeder Farm plot between 5th and 4th Ave. on Cheyenne Rd.
Great Bend	Stacy Campbell	May 23	8:30 a.m.	2.5 miles west of Great Bend on West Barton Co. Road at the intersection of NW 50th Ave on north side of highway.
Newton	Ryan Fleming	May 23	12:00 p.m.	48th and Hoover.
Belle Plaine	Jeff Seller/Randy Hein	May 23	6:00 p.m.	70th N and N Greenwich ¼ South West Side

Andale	Jeff Seller/Randy Hein	May 24	8:00 a.m.	From Andale, 5 ½ miles south on247th St. W. Plot on east side of the road.
Clearwater	Jeff Seller/Randy Hein	May 24	11:00 a.m.	From Clearwater, 1 mile north on 135th W to 95th St. S, 1/8 mile west on 95th St, plot on north side of road
Caldwell	Jeff Seller/Randy Hein	May 24	6:00 p.m.	From Caldwell, 1 ½ miles east of railroad tracks on Hwy 81, north side of road
Russell	Craig Dinkel	May 25	8:00 a.m.	Just east of the High School football field, corner of State St and North Copland St
Lorraine	Craig Dinkel	May 25	11:30 a.m.	1 mile south of Lorraine on 10th Rd to Ave W, turn west, go 2 miles. Plot located just west of 8th Rd on Ave W.
Riley	Greg McClure	May 25	6:30 p.m.	From Riley, 3 miles east on Hwy 24, 2 ½ miles south on Anderson Ave then 1 mile east on North 52nd St. Plot is on the SAVE Farm.

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